

and seven females from the Malay Peninsula (the type locality of *modesta* is Malacca) measure: wing, 70–86 (78.2); tail, 39.5–52 (45.5); culmen, 33–40 (35.7). Three males and two females from East Borneo measure: wing, 76–89.5 (82.4); tail, 44.5–57 (49.6); culmen, 35–40 (37.3). Sumatran specimens are slightly more yellowish green above than Malay Peninsula birds and appear to be a little smaller. Three males and three females from Sumatra measure: wing, 72–83 (77.7); tail, 39–50 (44); culmen, 31–35 (32.8).

Arachnothera affinis affinis of Java is much more yellowish above than the Bornean series and below is darker, more grayish; it is rather heavily streaked below like the Bornean form, however. Two males and one female from Java measure: wing, 78–91 (84); tail, 47–59 (52.2); culmen, 33.5–36 (34.5).

Whether *Arachnothera affinis pars* is confined to Dutch East Borneo or not is not known at present, but it seems incredible that such a well-marked form should have escaped naming so long, if it was more generally distributed upon the island.

ZOOLOGY.—*Crabs as food in India*.¹ A. RAMAKRISHNA REDDY, Annamalai University, S. India. (Communicated by WALDO L. SCHMITT.)

Crabs are used extensively for food in India, particularly in all provinces that border on the sea. In Bengal the crabs fished are *Scylla serrata* (Forskål), *Neptunus pelagicus* (Linn.), and *Charybdis crucifera* (Fabr.). *Scylla* is the most important and is very much relished by the Bengalese. The other two only occasionally are brought to market. In Bengal the freshwater *Parathelphusa spinigera* (Wood-Mason) and the estuarine *Varuna litterata* (Fabr.) are taken for domestic use by the poorer classes.

Along the coast of Bombay and Sind, *S. serrata*, *Neptunus sanguinolentus* (Herbst), and *C. crucifera* are most frequently caught. The *Parathelphusa* fished in this region is *P. jacquimontii* (Rathbun).

In Madras, *N. pelagicus*, *N. sanguinolentus*, *S. serrata*, *Matuta victor* (Fabr.), and *C. crucifera*, listed in the order of their importance, form a large scale fishery. Here the freshwater species consumed locally are *Parathelphusa hydrodromus* (Herbst) and *P. bouvieri* (Rathbun).

Scylla reaches a large size, 8 to 12 inches in width. In Chilka Lake it may attain a width of a foot and a half! *Charybdis* also grows to a large size, but *Neptunus* not over 8 inches in width. *Parathelphusa* ranges from 2 to 5 inches, while *Varuna* never exceeds 2. *Matuta* grows slightly larger than *Varuna*.

¹ Prepared in response to an inquiry from Dr. Waldo L. Schmitt, of the United States National Museum. I am indebted to Dr. B. N. Chopra, of the Indian Zoological Survey, Calcutta, for assistance in the preparation of this article and also to the Director of Fisheries, Government of Madras, the Director of Industries, Government of Bombay, and the Fisheries Expert with the Government of Bengal. Received December 22, 1938.

In taking *Scylla* commercially² a stout bamboo pole is firmly planted on one bank of a creek where the crabs are found. One end of a strong line is attached to this pole. The other is rowed to the opposite bank. From it are suspended a number of smaller lines bearing baits secured to slip nooses. In their efforts to carry off the bait, the crabs are caught in the nooses. Then the line is slowly pulled in and the crabs removed to the hold of the boat, where they may be kept alive for many days. *Scylla* is captured on a small scale by means of an iron hook affixed to a bamboo pole which is used to pull the crab out of its burrow. For the more active swimming crabs, *Charybdis* and *Neptunus*, sieve-nets are used.

In Bengal, large numbers of *Varuna* are obtained for domestic use with circular dipnets like those used for the capture of the soft-shelled blue crab, *Callinectes sapidus*, in America. The *Parathelphusa* fishery of Madras also employs dipnets. In and around Bombay this crab is caught in large numbers in light traps similar to those used in America for hard-shelled *Callinectes sapidus*.³ *Parathelphusa* is also secured by means of a long stick ending in a swollen knob and provided with a bamboo sleeve which may be slipped down against the knob. This implement is inserted into the crab's burrow. When the crab takes hold of the knob, the bamboo sleeve slips down over its claw, clamping it so tightly that the crab may be successfully pulled out.

In Madras crabbing is an important occupation. A "hook and line" like that employed for catching fish is used. *Hippa* is the common bait. In back waters, floating crab traps are used. Crabs on the west coast are caught in small quantities mainly in cast nets, but also in seines and trawl nets along with fish. In the Gulf of Manaar and Palk Bay wicker traps are common.

Crabs are usually fried or served as soup. From *Scylla* and *Neptunus* only fried dishes are prepared, as follows:

Break the shells of 10 of these crabs so that the animals may be immersed in water, discarding the carapace, gills, and legs. Boil for 15 minutes, after which add 2 tablespoons of chili powder, $\frac{1}{4}$ teaspoon of cinnamon bark, 2 tablespoons of coriander powder, and $\frac{1}{2}$ teaspoon of salt. Boil for about 5 minutes more. Meanwhile, fry 4 teaspoons of onion chips and one teaspoon of peeled garlic in ghee, gingilee oil, or cocoanut oil until the ingredients turn yellow; also fry separately 6 cloves and 4 pods of cardamon. Add all the fried ingredients to the boiling crabs and continue boiling for 2 or 3 minutes more.

² HORA, S. L. *Crab fishing at Uttarbhag, Lower Bengal*. *Current Science*, 3 (11): 543. 1935.

³ METCALF, Z. P. *A Text-book of Economic Zoology*, p. 188. 1930.

Fried dishes like the foregoing are also prepared from *Parathelphusa*, but in this case the quantities of ingredients will do for as many as 30 of these smaller crabs.

Soup is generally made from *Parathelphusa* as follows:

Crush 10 adult crabs without discarding either shell or gills. Boil for 15 minutes, after which add 2 teaspoons of pepper, $\frac{1}{2}$ teaspoon of cumin, 1 teaspoon of peeled garlic, and 1 teaspoon of salt, and continue boiling for 20 to 30 minutes longer.

These crab dishes are considered of great medicinal value. Those of *Scylla* and *Neptunus* are used for convalescing malaria patients, also by asthma sufferers. The crab dish seems to act as a specific tonic. *Parathelphusa* soup is used for colds. The extensive use of crabs in such cases cannot be without some justification. In Indian medicine⁴ crab curries are recommended for chronic fevers. There may be some mineral salts of medicinal value in the digestive glands of these animals or vitamins which are not destroyed in the cooking process. An investigation of the medicinal value of crabs as food appears to be indicated.

As our Indian crab fisheries have never been properly developed, there is great room for future expansion. The crustaceans fished throughout India perhaps outweigh both in quantity and value the yield of all other fisheries. Prawns rank first, with the crabs a good second. In 1923, crabs and prawns worth Rs. 135,056-14-0 (\$33,764 \pm) were sold in Madras.⁵ The fishery statistics available for the west coast of the Presidency of Madras show that on an average about 500 maunds⁶ of crabs worth Rs. 8,000 (\$2,000 \pm) are landed annually on the Malabar and South Kanara coast alone. In Bombay annually 80,000 crabs are caught and sold for Rs. 10,000 (\$2,500 \pm). In Bombay and Sind together, 500,000 crabs are caught and sold for approximately Rs. 30,000 (\$7,500 \pm) every year. In one year prawns and crabs fished along the Bombay coast sold for Rs. 2,500,000 (\$625,000 \pm). For Sind the figures are Rs. 1,500,000 (\$375,000 \pm). Large quantities are caught elsewhere in India, notably in Bengal.

If modern methods were employed and the crab and prawn fisheries properly developed, the industry would flourish. Only the Government of Madras has a modern department of fisheries which is giving some attention to the crab and prawn fisheries, but less than their importance warrants. The crabs are of such economic importance

⁴ Vastugunadipika. A Telugu Publication, 1914.

⁵ MOSES, S. T. Bull. Madras Fisheries, 15 (6): 139. 1923.

⁶ The maund, as generally used throughout India equals 82.284 pounds; in Madras, it sometimes may equal only about 25 pounds.

that Dr. B. N. Chopra's suggestions of the formation of an All-India Central Co-ordinating Organization for the Study of the scientific problems connected with our vast inland and coastal fisheries should receive earnest consideration by the Government.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

THE ACADEMY

RECENTLY ELECTED TO RESIDENT MEMBERSHIP IN THE ACADEMY

HARRY S. BERNTON, practicing physician and professor of hygiene and preventive medicine, Georgetown University, in recognition of contributions in the field of protein sensitization.

GERARD DIKMANS, parasitologist, Bureau of Animal Industry, in recognition of his contributions to parasitology, especially helminth parasites of ruminants.

IRVINE T. HAIG, principal silviculturist, U. S. Forest Service, in recognition of his contributions to forest research, particularly on the growth, yield, and natural reproduction of the Western White Pine of the Northwest.

ELMER HIGGINS, chief, Division of Scientific Inquiry, U. S. Bureau of Fisheries, in recognition of his contributions to marine biology as related to the fisheries.

HUGH CURTIS MCPHEE, chief, Division of Animal Husbandry, Bureau of Animal Industry, in recognition of his contributions in the field of genetics of plants and animals.

ELMER MARTIN NELSON, principal chemist, Food and Drug Administration, in recognition of his researches in the field of nutrition and vitamins.

WALTER RAMBERG, physicist, National Bureau of Standards, in recognition of his contributions to mechanics, in particular his researches in the mechanics of structures.

SANFORD MORRIS ROSENTHAL, senior pharmacologist, National Institute of Health, in recognition of his researches on the test for liver function, the pharmacology of arsphenamines and mercury, and the chemotherapy of sulfanilamide.

HARRY WALTNER TITUS, senior biological chemist, Bureau of Animal Industry, in recognition of his contributions to the physiology and chemistry of nutrition, in particular the nutrition of poultry.

EVERETT ELMER WEHR, associate zoologist, Bureau of Animal Industry, in recognition of his contributions to helminthology, particularly nematode parasites of birds.